

ASOS MODIFICATION NOTE 11 (for Electronics Technicians)

Engineering Division

W/OSO321:BGM

SUBJECT : Automatic Surface Observing System (ASOS) Freezing Rain Sensor

PURPOSE : Add a sensor to measure freezing rain on existing ASOS.

EQUIPMENT AFFECTED : ASOS

PARTS REQUIRED : Reference parts listed in the attached Field Modification Kit (FMK #019).

MOD PROCUREMENT : The above parts will be provided by the contractor, AAI Systems Management, Inc., as ASOS FMK #019.

SPECIAL TOOLS REQUIRED : None

TIME REQUIRED : 4 hours

EFFECT ON OTHER INSTRUCTIONS : None

CERTIFICATION STATEMENT : This modification is authorized by Engineering Change Proposal E92SM05F030, Revision A, and E935M05FO92 (ZR Sensor Circuit Breaker Module). This modification is being tested for operational integrity by the Engineering Design Branch and sites listed in Appendix B.

GENERAL

This modification note provides a procedure to install the freezing rain sensor. The freezing rain sensing device consists of a small cylindrical probe which, when stimulated, vibrates at 40 kHz, its resonant frequency. When ice freezes to the probe its mass changes and the result is the resonant vibration frequency decreases. The sensor is sensitive enough to measure accumulation rates as low as 0.01 inch per hour.

PROCEDURE:

Instructions are provided in FMK #019 for installation of the freezing rain sensor. Reference installation instructions for FMK #15C (EHB-11, Section 3.6, Modification Note 10) ASOS software version 2.05 upgrade provided by AAI Systems Management, Inc. FMK #15C must be completed prior to or concurrent with this modification note.

REPORTING MODIFICATION

Target date for completing this modification is 15 days after receipt of parts. Report completed modification on WS Form H-28, Engineering Progress Report, according to instructions in EHB-4, part 2, using reporting code ASOS.

Make appropriate entries in the SYSLOG using the Maintenance Action keys, Field Modification keys, and comment fields.

J. Michael St. Clair
Chief, Engineering Division

Attachment
FMK #019

W/OSO321:BGMcCormick:rhz:11/17/93:11/23/93"amod11.H11"
disk EHB-11a:spellchecked rhz

FMK #019 Appendix A

EHB-11
Issuance 93-

MODIFICATION

PARTS LIST

F/N	Qty.	P/N	NOMENCLATURE
32	4 EA	MS35308-468	Screw, Hex Head
33	4 EA	MS51971-7	Nut, Hex
34	4 EA	MS35338-145	Washer, Lock
35	4 EA	MS15795-820	Washer, Flat
39	1 EA	62828-90253-1	Lug
40	1 EA	62828-90254-1	Connector, Split Bolt
41	1 EA	62828-90115-10	Freezing Rain Sensor
	1 EA	62828-90324-1	Mounting Pole
93	1 EA	62828-40213-1	Liner, Plastic
	6 Ft	QQW343S10S1B	Wire, Solid Copper
	1 EA	62828-PWR-HAR	AC Power Harness
	1 EA	62828-40155-90	Circuit Breaker Module
	1 EA	62828-90006-1	Fiber Optic Modem
	6 Ft	62828-90096-1	Flexible Conduit
	1 EA	62828-42040-30	Fiber Optic Cable
	4 EA	62828-90075-1	Screw, Metric
	4 EA	MS35338-134	Washer Look
	1 EA	DCPA3A7RX	Marker
	1 EA	DCPA3A7TX	Marker
	1 EA	62828-90256-1	Tywrap
	2 EA	62828-90097-1	Connector, Flex Conduit
	2 EA	62828-90293-1	O-Ring Gasket
	5 EA	62828-90132-11	Terminal Lug, Spade

This procedure describes the reconfiguration of the DCP to accommodate the freezing rain sensor. The freezing rain sensor requires a separate circuit breaker for heater power. The visibility sensor requires only electronic power. **Skip steps 4 through 14, 45, and 46 if visibility circuit breaker module is already in slot A1A3A8.** Follow the instructions below to make this modification.

1. Open the DCP door, set UPS power switch to 0 (OFF) on CLASS II systems only, and turn off the UPS POWER circuit breaker A1A3A1.
2. Open the DCP Power Distribution Panel and turn off the DCP power. This will remove all power to the DCP and the sensors.
3. Is there a "VIS" circuit breaker module in A1A3A3? If **Yes** go to next step. If **No** skip to step 15.
4. Remove circuit breaker module A1A3A3 "VIS" and insert into A1A3A8 position.
5. Open the DCP Faraday box to gain access to the sensor power wiring and the fiber optic modems.
6. Remove the blank cover from A7 position and save the gasket.
7. Install fiber optic modem (62828-90006-1) and the gasket in position A7 using screws (62828-90075-1) and washers (MS35338-134).
8. Locate the SIO connector in the DCP harness marked A3A7J1. Connect this connector to fiber optic modem just installed in position A7 and tighten the screws on the connector.

NOTE: In steps 9, 10, and 11 the changes are made to the power connections on the terminal boards on the inside of the Faraday box door.

9. Remove the black and red wires from terminal board A17-4 and move them to terminal A17-9.
10. Remove white and yellow wires from A18-4 and move them to A18-9.
11. Remove green wire from A18-4G and move it to A18-9G.
12. Remove the fiber optic cable marked DCPA3A2TX. Remove marker sleeve and replace with marker sleeve DCPA3A7TX.
13. Remove the fiber optic cable marked DCPA3A2RX. Remove marker sleeve and replace with marker sleeve DCPA3A7RX.
14. Connect the fiber optic cable to the fiber optic modem in position A7. Ensure that the RX and TX are properly connected.
15. Install "FR" circuit breaker module (62828-40155-90) into A3 slot.

NOTE: If "VIS" Circuit Breaker Module was moved in Step 4 skip to Step 19.

16. Open the DCP Faraday box to gain access to the sensor power wiring and the fiber optic modems and remove the blank cover from A2 position and save the gasket.
17. Install fiber optic modem (62828-90006-1) and the gasket in position A2 using screws (62828-90075-1) and washers (MS35338-134).
18. Locate the SIO connector in the DCP harness marked A3A2J1. Connect this connector to F.O. Modem located in position A2 and tighten the screws on the connector.
19. At pedestal No. 3 remove the cover on top of raceway and the access plug on the side of the raceway.
20. Install connectors P/N 62828-90097-1 on both ends of the 6 foot piece of flex conduit P/N 62828-90096-1. Remove retaining nut from one end of conduit and install O Ring gasket P/N 62828-90293-1 on connector. Locate pull cord inside of raceway and bring pull cord out through retaining nut (**retaining nut MUST be installed on inside of raceway**) and side hole of raceway. Secure flex conduit to raceway.
21. Attach fiber optic cable (62828-42040-30) and power wiring harness (16 ga. black, 16 ga. white, 16 ga. red, 16 ga. yellow and 16 ga. green wire) to pull cord. Locate other end of pull cord in the DCP Faraday box and pull the fiber optic cables and power wiring through raceway into Faraday box. Allow enough length to connect to the fiber optic modem.

CAUTION

Fiber optic cables are delicate and should be handled with care.

22. Connect fiber optic cable marked DCPA3A2TX and DCPA3A2RX to fiber optic modem installed in position A2. Ensure that the RX and TX are properly connected.
23. Strip 1/4 inch insulation off of black wire and connect to terminal A17-4.
24. Strip 1/4 inch insulation off of white wire and connect to terminal A18-4.
25. Strip 1/4 inch insulation off of red wire and connect to terminal A17-20.
26. Strip 1/4 inch insulation off of yellow wire and connect to terminal A18-20.
27. Strip 1/4 inch insulation off of green wire and connect to terminal A18-4G.
28. At sensor pedestal No. 3 install freezing rain sensor mounting pole (P/N 62828-90324-1) with plastic liner (P/N 62828-40213-1) between pedestal and mounting pole using four hex head screws (P/N MS35308468), four hex nuts (P/N MS51971-7), four lock washers (P/N MS35338-145), and eight flat washers (P/N MS15795-820).

CAUTION

1. The freezing rain sensor's protective cover and tip cover must be removed prior to operation.
2. The sensor tip gets extremely hot and can also be damaged by oils from fingertips. **DO NOT TOUCH SENSOR TIP!**

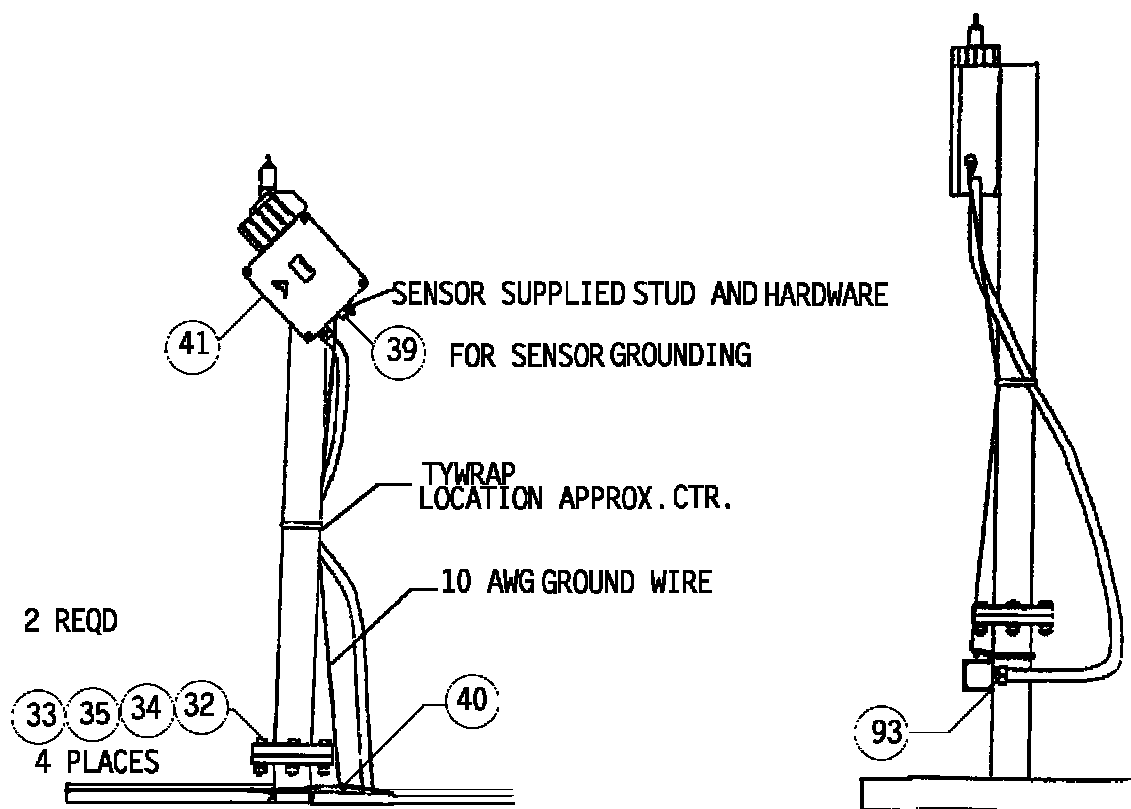
29. Install freezing rain sensor P/N 62828-90115-10 on mounting pole using hardware supplied with sensor. Refer to installation drawing (Figure A-8) for proper orientation of sensor.
30. Open door of freezing rain sensor. Remove retaining nut from end of flex conduit and install O Ring gasket P/N 62828-90097-1 on conduit. Route fiber optic cable, power wiring, and flex conduit through entry hole on sensor. Secure flex conduit to sensor using retaining nut that was removed previously in this step.
31. Cut black wire to length, strip and install terminal lug P/N 62828-90132-11 on wire and connect wire to TB1-1.
32. Cut white wire to length, strip and install terminal lug P/N 62828-90132-11 on wire and connect wire to TB-2.
33. Cut green wire to length, strip and install terminal lug P/N 62828-90132-11 on wire and connect wire to TB-3.
34. Cut red wire to length, strip and install terminal lug P/N 62828-90132-11 on wire and connect wire to TB-4.
35. Cut yellow wire to length, strip and install terminal lug P/N 62828-90132-11 on wire and connect wire to TB-5.
36. Connect fiber optic cable to fiber optic modem making sure RX and TX are installed properly.
37. Install lug P/N 62828-90253-1 on 6-foot piece of 10 ga. solid wire P/N QQW343S1OS1B. Connect wire to ground stud on sensor using hardware supplied with sensor. Connect other end of ground wire to system ground wire running along top of raceway using split bolt connector P/N 62828-90254-1.
38. Secure flex conduit and ground wire to sensor pole using Tywrap P/N 62828-90256-1. See installation drawing for approximate location.
39. Close the sensor door and reinstall cover on top of raceway using existing hardware.
40. Close Faraday box and secure using existing hardware.
41. Set the freezing rain sensor circuit breakers (P/N 62828-90155-90) A1A3A2 **ON**. CB1 and CB2 need to be turned on.
42. Turn UPS "OUTPUT POWER" A1A3A1 **ON**. Set UPS power switch to 1 (ON) CLASS II SYSTEMS ONLY.
43. Turn ON the DCP Power Circuit Breaker in Power Distribution Panel. Close and secure power distribution panel door. Power is now restored to DCP and all sensors. Secure DCP door.

NOTE: The physical installation of the freezing rain sensor is now complete. The freezing rain sensor must now be configured on the system. The setup of sensor is accomplished through the OID.

44. If you moved VISIBILITY from A1A3A3 TO A1A3A8 go to next step. If VISIBILITY circuit breaker was not moved skip to step 47.
45. Sign on OID as a TECHNICIAN and Press REVUE - SITE - CONFG - SENSR CHANG.
Move cursor to SIO #1 Port 3 and type "FR" on keyboard.
Move cursor to SIO #2 Port 4 and type "V1" on keyboard.
Press BACK - ALGOR to verify visibility configuration.
Press EXIT.
46. Press MAINT and move cursor to DCP #1.
Press SEL and move cursor to FREEZING RAIN.
Press SEL and verify sensor response status.
Press BACK and move cursor to VISIBILITY #1.
Press SEL and verify sensor response status.
Press EXIT - REVUE - SENSR - 12-HR Vis EXCO-will be displayed under VIS #1.
Press PAGE. Frequency of freezing rain probe will be displayed under ZR. Nominal Frequency is 40000.
Press EXIT After 10 minutes of operation visibility will be displayed on one minute screen. ZRNO will not be displayed in the REMARKS segment.
Press MAINT and Clear Fail Counts for Freezing Rain and Visibility sensors. Press EXIT.

This completes installation of freezing rain sensors.

	FROM	TO	WIRE No.	COLOR
=====				
Visibility		DCP		
TB1-1		A17-9	6	BLACK
TB1-2		A18-9	6	WHITE
TB1-3		A18-9G	6	GREEN
TB1-4		A17-9	6	RED
TB1-5		A18-9	6	YELLOW
TX		RX FIBER OPTIC CABLE		
RX		TX FIBER OPTIC CABLE		
Freezing Rain		DCP		
TB1-1	A17-4	5		BLACK
TB1-2	A18-4	5		WHITE
TB1-3	A18-4G	5		GREEN
TB1-4	A17-20	5		RED
TB1-5	A18-20	5		YELLOW
TX	RX	FIBER OPTIC CABLE		RX TX
FIBER OPTIC CABLE				



INSTALLATION DRAWING

Freezing Rain Field Testing Sites

AAI/SMI shall provide Freezing Rain Sensor Field Modification Kits to the following locations.

Albany, NY (ALB)
Atlantic City, NJ (ACY)
Binghamton, NY (BGM)
Erie, PA (ERI)
Portland, ME (PWM)
Sterling, VA (ST1)
Williamsport, PA (IPT)
Worcester, MA (ORH)
Detroit, MI (DTW)
Flint, MI (FNT)
Peoria, IL (PIA)
Rockford, IL (RFD)
Sioux City, IA (SUX)
Springfield, IL (SPI)
Spokane, WA (GEG)

ASOS FIELD MOD KIT (FMK)

CONTRACT 50-SANW-1-00050
UPON COMPLETION OF MOD, COMPLETE LOWER SECTION
OF THIS SHEET AND RETURN TO:
AAI SYSTEMS MANAGEMENT INC.
11101 GILROY ROAD
HUNT VALLEY, MD. 21030-1108

NOTE: MAKE A COPY FOR ON-SITE RECORDS

Date Prepared: 09/29/92 Task Order/ECP: E92SM05F030 ECN No: N/A

Part Numbers Affected: NUMEROUS ASOS SYSTEMS INSTALLED IN THE FIELD

Documentation Included: 1. Modification Parts List
2. Modification instructions
3. Modification Wiring Instructions
4. Installation Drawing

Description of Change: Add the freezing rain sensor to the existing ASOS
systems in the field, install the sensor and modify the system per the
instructions contained herein.

Parts Included: See parts list enclosed

QA Concurrence With FMK: _____

=====

Date modification complete: _____

Part Removed Serial # _____

Part Installed Serial # _____

Person Completing Modification: _____

MODIFICATION

PARTS LIST

F/N	Qty.	P/N	NOMENCLATURE
32	4 EA	MS35308-468	Screw, Hex Head
33	4 EA	MS51971-7	Nut, Hex
34	4 EA	MS35338-145	Washer, Lock
35	4 EA	MS15795-820	Washer, Flat
39	1 EA	62828-90253-1	Lug
40	1 EA	62828-90254-1	Connector, Split Bolt
41	1 EA	62828-90115-10	Freezing Rain Sensor
	1 EA	62828-90324-1	Mounting Pole
93	1 EA	62828-40213-1	Liner, Plastic
	6 Ft	QQW343S10S1B	Wire, Solid Copper
	1 EA	62828-PWR-HAR	AC Power Harness
	1 EA	62828-40155-90	Circuit Breaker Module
	1 EA	62828-90006-1	Fiber Optic Modem
	6 Ft	62828-90096-1	Flexible Conduit
	1 EA	62828-42040-30	Fiber Optic Cable
	4 EA	62828-90075-1	Screw, Metric
	4 EA	MS35338-134	Washer Look
	1 EA	DCPA3A7RX	Marker
	1 EA	DCPA3A7TX	Marker
	1 EA	62828-90256-1	Tywrap
	2 EA	62828-90097-1	Connector, Flex Conduit
	2 EA	62828-90293-1	O-Ring Gasket
	5 EA	62828-90132-11	Terminal Lug, Spade

MODIFICATION INSTRUCTIONS

This procedure describes the reconfiguration of the DCP to accommodate the freezing rain sensor. The freezing rain sensor requires a separate circuit breaker for heater power. The visibility sensor requires only electronic power. **Skip steps 4 through 14, 45, and 46 if visibility circuit breaker module is already in slot A1A3A8.** Follow the instructions below to make this modification.

1. Open the DCP door, set UPS power switch to 0 (OFF) on CLASS II systems only, and turn off the UPS POWER circuit breaker A1A3A1.
2. Open the DCP Power Distribution Panel and turn off the DCP power. This will remove all power to the DCP and the sensors.
3. Is there a "VIS" circuit breaker module in A1A3A3? If **Yes** go to next step. If **No** skip to step 15.
4. Remove circuit breaker module A1A3A3 "VIS" and insert into A1A3A8 position.
5. Open the DCP Faraday box to gain access to the sensor power wiring and the fiber optic modems.
6. Remove the blank cover from A7 position and save the gasket.
7. Install fiber optic modem (62828-90006-1) and the gasket in position A7 using screws (62828-90075-1) and washers (MS35338-134).
8. Locate the SIO connector in the DCP harness marked A3A7J1. Connect this connector to fiber optic modem just installed in position A7 and tighten the screws on the connector.

NOTE: In steps 9, 10, and 11 the changes are made to the power connections on the terminal boards on the inside of the Faraday box door.

9. Remove the black and red wires from terminal board A17-4 and move them to terminal A17-9.
10. Remove white and yellow wires from A18-4 and move them to A18-9.
11. Remove green wire from A18-4G and move it to A18-9G.
12. Remove the fiber optic cable marked DCPA3A2TX. Remove marker sleeve and replace with marker sleeve DCPA3A7TX.
13. Remove the fiber optic cable marked DCPA3A2RX. Remove marker sleeve and replace with marker sleeve DCPA3A7RX.
14. Connect the fiber optic cable to the fiber optic modem in position A7. Ensure that the RX and TX are properly connected.
15. Install "FR" circuit breaker module (62828-40155-90) into A3 slot.

NOTE: If "VIS" Circuit Breaker Module was moved in Step 4 skip to Step 19.

16. Open the DCP Faraday box to gain access to the sensor power wiring and the fiber optic modems and remove the blank cover from A2 position and save the gasket.
17. Install fiber optic modem (62828-90006-1) and the gasket in position A2 using screws (62828-90075-1) and washers (MS35338-134).
18. Locate the SIO connector in the DCP harness marked A3A2J1. Connect this connector to F.O. Modem located in position A2 and tighten the screws on the connector.
19. At pedestal No. 3 remove the cover on top of raceway and the access plug on the side of the raceway.
20. Install connectors P/N 62828-90097-1 on both ends of the 6 foot piece of flex conduit P/N 62828-90096-1. Remove retaining nut from one end of conduit and install O Ring gasket P/N 62828-90293-1 on connector. Locate pull cord inside of raceway and bring pull cord out through retaining nut (**retaining nut MUST be installed on inside of raceway**) and side hole of raceway. Secure flex conduit to raceway.
21. Attach fiber optic cable (62828-42040-30) and power wiring harness (16 ga. black, 16 ga. white, 16 ga. red, 16 ga. yellow and 16 ga. green wire) to pull cord. Locate other end of pull cord in the DCP Faraday box and pull the fiber optic cables and power wiring through raceway into Faraday box. Allow enough length to connect to the fiber optic modem.

CAUTION

Fiber optic cables are delicate and should be handled with care.

22. Connect fiber optic cable marked DCPA3A2TX and DCPA3A2RX to fiber optic modem installed in position A2. Ensure that the RX and TX are properly connected.
23. Strip 1/4 inch insulation off of black wire and connect to terminal A17-4.
24. Strip 1/4 inch insulation off of white wire and connect to terminal A18-4.
25. Strip 1/4 inch insulation off of red wire and connect to terminal A17-20.
26. Strip 1/4 inch insulation off of yellow wire and connect to terminal A18-20.
27. Strip 1/4 inch insulation off of green wire and connect to terminal A18-4G.
28. At sensor pedestal No. 3 install freezing rain sensor mounting pole (P/N 62828-90324-1) with plastic liner (P/N 62828-40213-1) between pedestal and mounting pole using four hex head screws (P/N MS35308468), four hex nuts (P/N MS51971-7), four lock washers (P/N MS35338-145), and eight flat washers (P/N MS15795-820).

CAUTION

1. The freezing rain sensor's protective cover and tip cover must be removed prior to operation.

2. The sensor tip gets extremely hot and can also be damaged by oils from fingertips.
DO NOT TOUCH SENSOR TIP!
29. Install freezing rain sensor P/N 62828-90115-10 on mounting pole using hardware supplied with sensor. Refer to installation drawing for proper orientation of sensor.
30. Open door of freezing rain sensor. Remove retaining nut from end of flex conduit and install O Ring gasket P/N 62828-90097-1 on conduit. Route fiber optic cable, power wiring, and flex conduit through entry hole on sensor. Secure flex conduit to sensor using retaining nut that was removed previously in this step.
31. Cut black wire to length, strip and install terminal lug P/N 62828-90132-11 on wire and connect wire to TB1-1.
32. Cut white wire to length, strip and install terminal lug P/N 62828-90132-11 on wire and connect wire to TB-2.
33. Cut green wire to length, strip and install terminal lug P/N 62828-90132-11 on wire and connect wire to TB-3.
34. Cut red wire to length, strip and install terminal lug P/N 62828-90132-11 on wire and connect wire to TB-4.
35. Cut yellow wire to length, strip and install terminal lug P/N 62828-90132-11 on wire and connect wire to TB-5.
36. Connect fiber optic cable to fiber optic modem making sure RX and TX are installed properly.
37. Install lug P/N 62828-90253-1 on 6-foot piece of 10 ga. solid wire P/N QQW343S1OS1B. Connect wire to ground stud on sensor using hardware supplied with sensor. Connect other end of ground wire to system ground wire running along top of raceway using split bolt connector P/N 62828-90254-1.
38. Secure flex conduit and ground wire to sensor pole using Tywrap P/N 62828-90256-1. See installation drawing for approximate location.
39. Close the sensor door and reinstall cover on top of raceway using existing hardware.
40. Close Faraday box and secure using existing hardware.
41. Set the freezing rain sensor circuit breakers (P/N 62828-90155-90) A1A3A2 **ON**. CB1 and CB2 need to be turned on.
42. Turn UPS "OUTPUT POWER" A1A3A1 **ON**. Set UPS power switch to 1 (ON) CLASS II SYSTEMS ONLY.
43. Turn ON the DCP Power Circuit Breaker in Power Distribution Panel. Close and secure power distribution panel door. Power is now restored to DCP and all sensors. Secure DCP door.

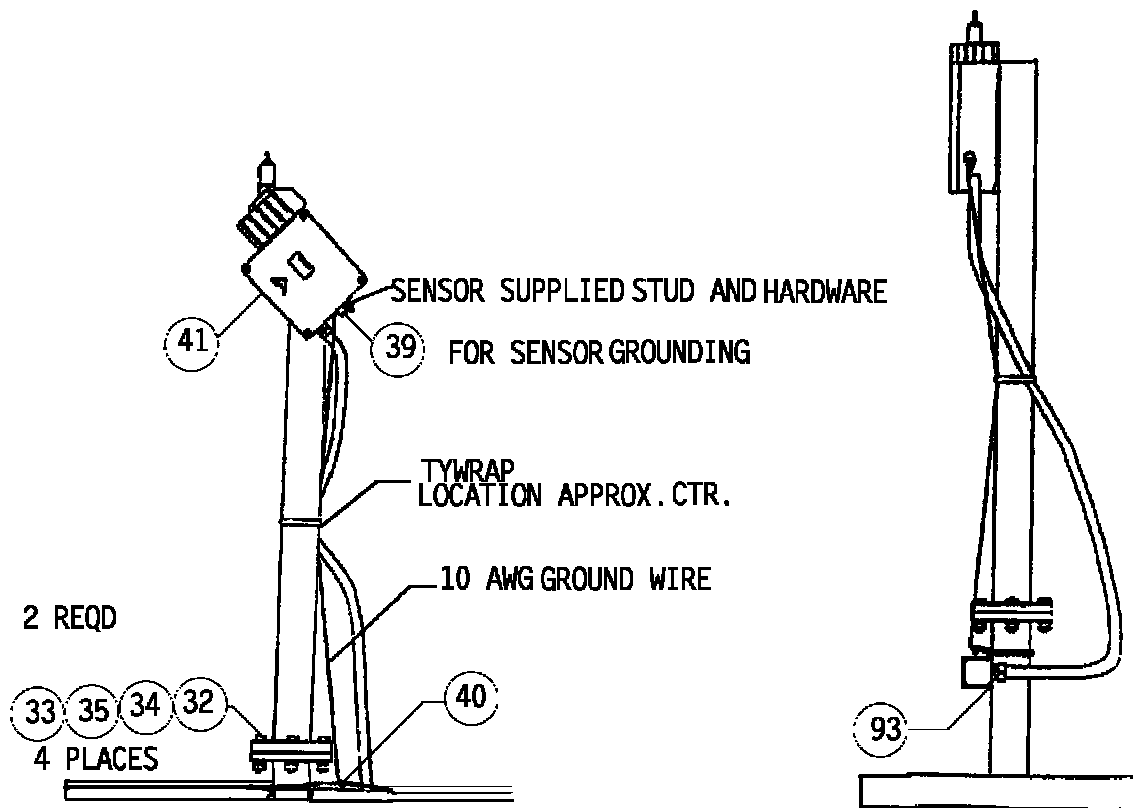
NOTE: The physical installation of the freezing rain sensor is now complete. The freezing rain sensor must now be configured on the system. The setup of sensor is accomplished through the OID.

44. If you moved VISIBILITY from A1A3A3 TO A1A3A8 go to next step. If VISIBILITY circuit breaker was not moved skip to step 47.
45. Sign on OID as a TECHNICIAN and Press REVUE - SITE - CONFG - SENSR CHANG.
Move cursor to SIO #1 Port 3 and type "FR" on keyboard.
Move cursor to SIO #2 Port 4 and type "V1" on keyboard.
Press BACK - ALGOR to verify visibility configuration.
Press EXIT.
46. Press MAINT and move cursor to DCP #1.
Press SEL and move cursor to FREEZING RAIN.
Press SEL and verify sensor response status.
Press BACK and move cursor to VISIBILITY #1.
Press SEL and verify sensor response status.
Press EXIT - REVUE - SENSR - 12-HR Vis EXCO-will be displayed under VIS #1.
Press PAGE. Frequency of freezing rain probe will be displayed under ZR. Nominal Frequency is 40000.
Press EXIT After 10 minutes of operation visibility will be displayed on one minute screen. ZRNO will not be displayed in the REMARKS segment.
Press MAINT and Clear Fail Counts for Freezing Rain and Visibility sensors. Press EXIT.

This completes installation of freezing rain sensors.

MODIFICATION
WIRING INSTRUCTIONS

FROM	TO	WIRE No.	COLOR
=====			
=====			
Visibility	DCP		
TB1-1	A17-9	6	BLACK
TB1-2	A18-9	6	WHITE
TB1-3	A18-9G	6	GREEN
TB1-4	A17-9	6	RED
TB1-5	A18-9	6	YELLOW
TX	RX	FIBER OPTIC CABLE	
RX	TX	FIBER OPTIC CABLE	
Freezing Rain	DCP		
TB1-1	A17-4	5	BLACK
TB1-2	A18-4	5	WHITE
TB1-3	A18-4G	5	GREEN
TB1-4	A17-20	5	RED
TB1-5	A18-20	5	YELLOW
TX	RX	FIBER OPTIC CABLE	
RX	TX	FIBER OPTIC CABLE	



INSTALLATION DRAWING

Freezing Rain Field Testing Sites

AAI/SMI shall provide Freezing Rain Sensor Field Modification Kits to the following locations.

Albany, NY (ALB)
Atlantic City, NJ (ACY)
Binghamton, NY (BGM)
Erie, PA (ERI)
Portland, ME (PWM)
Sterling, VA (ST1)
Williamsport, PA (IPT)
Worcester, MA (ORH)
Detroit, MI (DTW)
Flint, MI (FNT)
Peoria, IL (PIA)
Rockford, IL (RFD)
Sioux City, IA (SUX)
Springfield, IL (SPI)
Spokane, WA (GEG)